What is claimed is:

1. A control system for controlling a plant, comprising:

detection means for detecting a detection value reflecting a behavior of a first internal variable of the plant;

simulation value-generating means for generating a simulation value simulating the behavior of the first internal variable;

estimation means for estimating an estimation value of the detection value based on a model defining a relationship between the estimation value and the simulation value;

identification means for identifying a model parameter of the model according to the detected detection value and the generated simulation value, such that the estimated estimation value becomes equal to the detected detection value; and

first control means for determining a first input to be inputted to the plant, according to the identified model parameter.

2. A control system as claimed in claim 1, further comprising second control means for determining a second input to be inputted to the plant such that the detection value is caused to converge to a predetermined target value, and

wherein the first internal variable comprises a plurality of first internal variables, and

wherein the simulation value comprises a plurality of simulation values simulating respective behaviors of the plurality of first internal variables,

wherein the model parameter comprises a plurality

of model parameters, and

wherein said identification means identifies the plurality of model parameters according to the detection value and the plurality of simulation values such that the estimated estimation value becomes equal to the detected detection value, and

wherein said first control means determines the first input such that the identified model parameters converge to an average value thereof.

3. A control system as claimed in claim 1, wherein said first control means comprises:

learned correction value-calculating means for calculating a learned correction value of the first input, using a sequential statistical algorithm,

correction means for correcting the first input using the calculated learned correction value, and

input means for inputting the corrected first input to the plant.

4. A control system as claimed in claim 3, wherein said learned correction value-calculating means calculates the learned correction value of the first input using a regression equation in which the learned correction value is used as a dependent variable and a second internal variable having influence on the first internal variable is used as an independent variable, and calculates a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

5. A control system as claimed in claim 1, wherein said first control means determines an input component contained in the first input based on a difference between the model parameter and a predetermined target value.

6. A control system as claimed in claim 5, wherein said first control means determines other input components than the input component contained in the first input, based on the model parameter.

7. A control system as claimed in claim 1, wherein said first control means determines the first input according to the model parameter with a response-specified control algorithm.

8. A control system as claimed in claim 1, wherein said identification means identifies the model parameter by a fixed gain method.

9. A control system as claimed in claim 4, wherein said identification means identifies the model parameter by calculating a model parameter reference value according to the second internal variable, and adding a predetermined correction component to the calculated model parameter reference value.

10. A control system as claimed in claim 1, further comprising delay means for delaying one of the detection value and the simulation value by a predetermined delay time period, and

wherein said identification means identifies the model parameter according to the delayed one of the detection value and the simulation value, and the other of the detection value and the simulation value.

11. A control system as claimed in claim 1, further comprising filter means for generating a filtered value of the detection value by subjecting the detection value to predetermined filtering processing, and

wherein said identification means identifies the model parameter according to the filtered value of the detection value and the simulation value.

12. A control system for an internal combustion engine including a plurality of cylinders, a plurality of exhaust passages extending from the plurality of cylinders, respectively, and one exhaust passage into which the plurality of exhaust passages are combined, the control system controlling an amount of fuel to be supplied to the plurality of cylinders, on a cylinder-by-cylinder basis, thereby controlling an air-fuel ratio of exhaust gases emitted from the plurality of cylinders,

the control system comprising:

fuel amount-determining means for determining an amount of fuel to be supplied to each of the plurality of cylinders;

air-fuel ratio parameter-detecting means for detecting an air-fuel ratio parameter indicative of an air-fuel ratio of exhaust gases in the one exhaust passage;

simulation value-generating means for generating a plurality of simulation values simulating respective behaviors of air-fuel ratios of exhaust gases emitted from the plurality of cylinders;

estimation means for estimating an estimation value of the air-fuel ratio parameter based on a model defining a relationship between the estimation value and the plurality of simulation values;

identification means for identifying a plurality of model parameters of the model according to the detected air-fuel ratio parameter and the generated plurality of simulation values, such that the estimation value of the air-fuel ratio parameter becomes equal to the detected air-fuel ratio parameter;

first correction value-calculating means for

calculating a first correction value for correcting the amount of fuel to be supplied to the plurality of cylinders, according to the identified plurality of model parameters, on a cylinder-by-cylinder basis; and

first fuel amount-correcting means for correcting the determined amount of fuel according to the calculated first correction value, on a cylinder-by-cylinder basis.

13. A control system as claimed in claim 12, further comprising:

second correction value-calculating means for calculating a second correction value for correcting the amount of fuel to be supplied to each cylinder, such that the air-fuel ratio parameter is caused to converge to a predetermined target value, and

second fuel amount-correcting means for correcting the amount of fuel to be supplied to each cylinder according to the calculated second correction value, and

wherein said first correction value-calculating means calculates the first correction value, on a cylinder-by-cylinder basis, such that the identified plurality of model parameters converge to an average value thereof.

14. A control system as claimed in claim 12, further comprising learned correction value-calculating means for calculating a learned correction value of the first correction value with a sequential statistical algorithm, on a cylinder-by-cylinder basis, and

wherein said first fuel amount-correcting means corrects the amount of fuel further according to the calculated learned correction value, on a cylinder-by-cylinder basis.

15. A control system as claimed in claim 14, further comprising operating condition parameter-detecting means for detecting an operating condition parameter indicative of an operating condition of the engine, and

wherein said learned correction value-calculating means calculates the learned correction value using a regression equation in which the learned correction value is used as a dependent variable and the detected operating condition parameter is used as an independent variable, and calculates a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

16. A control system as claimed in claim 12, wherein said first correction value-calculating means calculates a correction value component contained in the first correction value based on a difference between the identified model parameters and a predetermined target value.

17. A control system as claimed in claim 16, wherein said first correction value-calculating means calculates other correction value components than the correction value component contained in the first correction value, based on the identified model parameters.

18. A control system as claimed in claim 12, wherein said first correction value-calculating means calculates the first correction value according to the model parameters with a response-specified control algorithm.

19. A control system as claimed in claim 12, wherein said identification means identifies the model parameters by a fixed gain method.

20. A control system as claimed in claim 15, wherein said identification means identifies the model parameters by calculating respective model parameter reference values according to the operating condition parameter, and adding predetermined correction components to the calculated model parameter reference values, respectively.

21. A control system as claimed in claim 12, further comprising delay means for delaying the air-fuel ratio parameter by a predetermined delay time period, and

wherein said identification means identifies the model parameters according to the delayed air-fuel ratio parameter and the plurality of simulation values.

22. A control system for an internal combustion engine including one intake passage, a plurality of intake passages branching from the one intake passage, and a plurality of cylinders connected to the plurality of intake passages extend, respectively, the control system controlling an amount of fuel to be supplied to the plurality of cylinders, on a cylinder-by-cylinder basis, thereby controlling an air-fuel ratio of exhaust gases emitted from the plurality of cylinders,

the control system comprising:

fuel amount-determining means for determining an amount of fuel to be supplied to each of the plurality of cylinders;

intake air amount parameter-detecting means disposed in the one intake passage, for detecting an intake air amount parameter indicative of an amount of intake air;

simulation value-generating means for generating a plurality of simulation values simulating respective

behaviors of amounts of intake air to be drawn into the plurality of cylinders;

estimation means for estimating an estimation value of the intake air amount parameter based on a model defining a relationship between the estimation value and the plurality of simulation values;

identification means for identifying a plurality of model parameters of the model according to the detected intake air amount parameter and the generated plurality of simulation values, such that the estimation value of the intake air amount parameter becomes equal to the detected intake air amount parameter;

third correction value-calculating means for calculating a third correction value for correcting the amount of fuel to be supplied to the plurality of cylinders, according to the identified plurality of model parameters, on a cylinder-by-cylinder basis; and

third fuel amount-correcting means for correcting the determined amount of fuel according to the calculated third correction value, on a cylinder-by-cylinder basis.

23. A control system as claimed in claim 22, wherein the engine includes a plurality of exhaust passages extending from the plurality of cylinders, respectively, and one exhaust passage into which the plurality of exhaust passages are combined,

the control system further comprising:

air-fuel ratio parameter-detecting means for detecting an air-fuel ratio parameter indicative of an air-fuel ratio of exhaust gases in the one exhaust passage;

fourth correction value-calculating means for

calculating a fourth correction value for correcting the amount of fuel to be supplied to each cylinder, such that the detected air-fuel ratio parameter is caused to converge to a predetermined target value, and

fourth fuel amount-correcting means for correcting the amount of fuel to be supplied to each cylinder according to the calculated fourth correction value, and

wherein said third correction value-calculating means calculates the third correction value, on a cylinder-by-cylinder basis, such that the identified plurality of model parameters converge to an average value thereof.

24. A control system as claimed in claim 22, further comprising learned correction value-calculating means for calculating a learned correction value of the third correction value with a sequential statistical algorithm, on a cylinder-by-cylinder basis, and

wherein said third fuel amount-correcting means corrects the amount of fuel further according to the calculated learned correction value, on a cylinder-by-cylinder basis.

25. A control system as claimed in claim 24, further comprising operating condition parameter-detecting means for detecting an operating condition parameter indicative of an operating condition of the engine, and

wherein said learned correction value-calculating means calculates the learned correction value using a regression equation in which the learned correction value is used as a dependent variable and the detected operating condition parameter is used as an independent variable, and calculates a regression coefficient and a

constant term of the regression equation with the sequential statistical algorithm.

26. A control system as claimed in claim 22, wherein said third correction value-calculating means calculates a correction value component contained in the third correction value based on a difference between the identified model parameters and a predetermined target value.

27. A control system as claimed in claim 26, wherein said third correction value-calculating means calculates other correction value components than the correction value component contained in the third correction value, based on the identified model parameters.

28. A control system as claimed in claim 22, wherein said third correction value-calculating means calculates the third correction value according to the model parameters with a response-specified control algorithm.

29. A control system as claimed in claim 22, wherein said identification means identifies the model parameters by a fixed gain method.

30. A control system as claimed in claim 25, wherein said identification means identifies the model parameters by calculating respective model parameter reference values according to the operating condition parameter, and adding predetermined correction components to the calculated model parameter reference values, respectively.

31. A control system as claimed in claim 22, further comprising delay means for delaying the plurality of simulation values by a predetermined delay time period, and

wherein said identification means identifies the model parameters according to the intake air amount parameter and the delayed plurality of simulation values.

32. A control system as claimed in claim 22, further comprising filter means for generating a filtered value of the intake air amount parameter by subjecting the intake air amount parameter to predetermined filtering processing, and

wherein said identification means identifies the model parameters according to the generated filtered value of the intake air amount parameter and the plurality of simulation values.

33. A control method for controlling a plant, comprising:

a detection step of detecting a detection value reflecting a behavior of a first internal variable of the plant;

a simulation value-generating step of generating a simulation value simulating the behavior of the first internal variable;

an estimation step of estimating an estimation value of the detection value based on a model defining a relationship between the estimation value and the simulation value;

an identification step of identifying a model parameter of the model according to the detected detection value and the generated simulation value, such that the estimated estimation value becomes equal to the detected detection value; and

a first control step of determining a first input to be inputted to the plant, according to the identified model parameter.

34. A control method as claimed in claim 33, further comprising a second control step of determining a second input to be inputted to the plant such that the detection value is caused to converge to a predetermined target value, and

wherein the first internal variable comprises a plurality of first internal variables, and

wherein the simulation value comprises a plurality of simulation values simulating respective behaviors of the plurality of first internal variables,

wherein the model parameter comprises a plurality of model parameters, and

wherein said identification step includes identifying the plurality of model parameters according to the detection value and the plurality of simulation values such that the estimated estimation value becomes equal to the detected detection value, and

wherein said first control step includes determining the first input such that the identified model parameters converge to an average value thereof.

35. A control method as claimed in claim 33, wherein said first control step comprises:

a learned correction value-calculating step of calculating a learned correction value of the first input, using a sequential statistical algorithm,

a correction step of correcting the first input using the calculated learned correction value, and

an input step of inputting the corrected first input to the plant.

36. A control method as claimed in claim 35, wherein said learned correction value-calculating step includes calculating the learned correction value of the first input using a regression equation in which

the learned correction value is used as a dependent variable and a second internal variable having influence on the first internal variable is used as an independent variable, and calculating a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

37. A control method as claimed in claim 33, wherein said first control step includes determining an input component contained in the first input based on a difference between the model parameter and a predetermined target value.

38. A control method as claimed in claim 37, wherein said first control step includes determining other input components than the input component contained in the first input, based on the model parameter.

39. A control method as claimed in claim 33, wherein said first control step includes determining the first input according to the model parameter with a response-specified control algorithm.

40. A control method as claimed in claim 33, wherein said identification step includes identifying the model parameter by a fixed gain method.

41. A control method as claimed in claim 36, wherein said identification step includes identifying the model parameter by calculating a model parameter reference value according to the second internal variable, and adding a predetermined correction component to the calculated model parameter reference value.

42. A control method as claimed in claim 33, further comprising a delay step of delaying one of the detection value and the simulation value by a

predetermined delay time period, and

wherein said identification step includes identifying the model parameter according to the delayed one of the detection value and the simulation value, and the other of the detection value and the simulation value.

43. A control method as claimed in claim 33, further comprising a filter step of generating a filtered value of the detection value by subjecting the detection value to predetermined filtering processing, and

wherein said identification step includes identifying the model parameter according to the filtered value of the detection value and the simulation value.

44. A control method for an internal combustion engine including a plurality of cylinders, a plurality of exhaust passages extending from the plurality of cylinders, respectively, and one exhaust passage into which the plurality of exhaust passages are combined, the control method controlling an amount of fuel to be supplied to the plurality of cylinders, on a cylinder-by-cylinder basis, thereby controlling an air-fuel ratio of exhaust gases emitted from the plurality of cylinders,

the control method comprising:

a fuel amount-determining step of determining an amount of fuel to be supplied to each of the plurality of cylinders;

an air-fuel ratio parameter-detecting step of detecting an air-fuel ratio parameter indicative of an air-fuel ratio of exhaust gases in the one exhaust passage;

a simulation value-generating step of generating a plurality of simulation values simulating respective behaviors of air-fuel ratios of exhaust gases emitted from the plurality of cylinders;

an estimation step of estimating an estimation value of the air-fuel ratio parameter based on a model defining a relationship between the estimation value and the plurality of simulation values;

an identification step of identifying a plurality of model parameters of the model according to the detected air-fuel ratio parameter and the generated plurality of simulation values, such that the estimation value of the air-fuel ratio parameter becomes equal to the detected air-fuel ratio parameter;

a first correction value-calculating step of calculating a first correction value for correcting the amount of fuel to be supplied to the plurality of cylinders, according to the identified plurality of model parameters, on a cylinder-by-cylinder basis; and

a first fuel amount-correcting step of correcting the determined amount of fuel according to the calculated first correction value, on a cylinder-by-cylinder basis.

45. A control method as claimed in claim 44, further comprising:

a second correction value-calculating step of calculating a second correction value for correcting the amount of fuel to be supplied to each cylinder, such that the air-fuel ratio parameter is caused to converge to a predetermined target value, and

a second fuel amount-correcting step of correcting the amount of fuel to be supplied to each cylinder according to the calculated second correction

value, and

wherein said first correction value-calculating step includes calculating the first correction value, on a cylinder-by-cylinder basis, such that the identified plurality of model parameters converge to an average value thereof.

46. A control method as claimed in claim 44, further comprising a learned correction value-calculating step of calculating a learned correction value of the first correction value with a sequential statistical algorithm, on a cylinder-by-cylinder basis, and

wherein said first fuel amount-correcting step includes correcting the amount of fuel further according to the calculated learned correction value, on a cylinder-by-cylinder basis.

47. A control method as claimed in claim 46, further comprising an operating condition parameter-detecting step of detecting an operating condition parameter indicative of an operating condition of the engine, and

wherein said learned correction value-calculating step includes calculating the learned correction value using a regression equation in which the learned correction value is used as a dependent variable and the detected operating condition parameter is used as an independent variable, and calculating a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

48. A control method as claimed in claim 44, wherein said first correction value-calculating step includes calculating a correction value component contained in the first correction value based on a

difference between the identified model parameters and a predetermined target value.

49. A control method as claimed in claim 48, wherein said first correction value-calculating step includes calculating other correction value components than the correction value component contained in the first correction value, based on the identified model parameters.

50. A control method as claimed in claim 44, wherein said first correction value-calculating step includes calculating the first correction value according to the model parameters with a response-specified control algorithm.

51. A control method as claimed in claim 44, wherein said identification step includes identifying the model parameters by a fixed gain method.

52. A control method as claimed in claim 47, wherein said identification step includes identifying the model parameters by calculating respective model parameter reference values according to the operating condition parameter, and adding predetermined correction components to the calculated model parameter reference values, respectively.

53. A control method as claimed in claim 44, further comprising a delay step of delaying the air-fuel ratio parameter by a predetermined delay time period, and

wherein said identification step includes identifying the model parameters according to the delayed air-fuel ratio parameter and the plurality of simulation values.

54. A control method for an internal combustion engine including one intake passage, a plurality of

intake passages branching from the one intake passage, and a plurality of cylinders connected to the plurality of intake passages extend, respectively, the control method controlling an amount of fuel to be supplied to the plurality of cylinders, on a cylinder-by-cylinder basis, thereby controlling an air-fuel ratio of exhaust gases emitted from the plurality of cylinders,

the control method comprising:

a fuel amount-determining step of determining an amount of fuel to be supplied to each of the plurality of cylinders;

an intake air amount parameter-detecting step of detecting an intake air amount parameter indicative of an amount of intake air in the one intake passage;

a simulation value-generating step of generating a plurality of simulation values simulating respective behaviors of amounts of intake air to be drawn into the plurality of cylinders;

an estimation step of estimating an estimation value of the intake air amount parameter based on a model defining a relationship between the estimation value and the plurality of simulation values;

an identification step of identifying a plurality of model parameters of the model according to the detected intake air amount parameter and the generated plurality of simulation values, such that the estimation value of the intake air amount parameter becomes equal to the detected intake air amount parameter;

a third correction value-calculating step of calculating a third correction value for correcting the amount of fuel to be supplied to the plurality of cylinders, according to the identified plurality of

model parameters, on a cylinder-by-cylinder basis; and

a third fuel amount-correcting step of correcting the determined amount of fuel according to the calculated third correction value, on a cylinder-by-cylinder basis.

55. A control method as claimed in claim 54, wherein the engine includes a plurality of exhaust passages extending from the plurality of cylinders, respectively, and one exhaust passage into which the plurality of exhaust passages are combined,

the control method further comprising:

an air-fuel ratio parameter-detecting step of detecting an air-fuel ratio parameter indicative of an air-fuel ratio of exhaust gases in the one exhaust passage;

a fourth correction value-calculating step of calculating a fourth correction value for correcting the amount of fuel to be supplied to each cylinder, such that the detected air-fuel ratio parameter is caused to converge to a predetermined target value, and

a fourth fuel amount-correcting step of correcting the amount of fuel to be supplied to each cylinder according to the calculated fourth correction value, and

wherein said third correction value-calculating step includes calculating the third correction value, on a cylinder-by-cylinder basis, such that the identified plurality of model parameters converge to an average value thereof.

56. A control method as claimed in claim 54, further comprising a learned correction value-calculating step of calculating a learned correction value of the third correction value with a sequential

statistical algorithm, on a cylinder-by-cylinder basis, and

wherein said third fuel amount-correcting step includes correcting the amount of fuel further according to the calculated learned correction value, on a cylinder-by-cylinder basis.

57. A control method as claimed in claim 56, further comprising an operating condition parameter-detecting step of detecting an operating condition parameter indicative of an operating condition of the engine, and

wherein said learned correction value-calculating step includes calculating the learned correction value using a regression equation in which the learned correction value is used as a dependent variable and the detected operating condition parameter is used as an independent variable, and calculating a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

58. A control method as claimed in claim 54, wherein said third correction value-calculating step includes calculating a correction value component contained in the third correction value based on a difference between the identified model parameters and a predetermined target value.

59. A control method as claimed in claim 58, wherein said third correction value-calculating step includes calculating other correction value components than the correction value component contained in the third correction value, based on the identified model parameters.

60. A control method as claimed in claim 54, wherein said third correction value-calculating step

includes calculating the third correction value according to the model parameters with a response-specified control algorithm.

61. A control method as claimed in claim 54, wherein said identification step includes identifying the model parameters by a fixed gain method.

62. A control method as claimed in claim 57, wherein said identification step includes identifying the model parameters by calculating respective model parameter reference values according to the operating condition parameter, and adding predetermined correction components to the calculated model parameter reference values, respectively.

63. A control method as claimed in claim 54, further comprising a delay step of delaying the plurality of simulation values by a predetermined delay time period, and

wherein said identification step includes identifying the model parameters according to the intake air amount parameter and the delayed plurality of simulation values.

64. A control method as claimed in claim 54, further comprising a filter step of generating a filtered value of the intake air amount parameter by subjecting the intake air amount parameter to predetermined filtering processing, and

wherein said identification step includes identifying the model parameters according to the generated filtered value of the intake air amount parameter and the plurality of simulation values.

65. A control unit including a control program for causing a computer to control a plant, wherein the control program causes the computer to detect a

detection value reflecting a behavior of a first internal variable of the plant, generate a simulation value simulating the behavior of the first internal variable, estimate an estimation value of the detection value based on a model defining a relationship between the estimation value and the simulation value, identify a model parameter of the model according to the detected detection value and the generated simulation value, such that the estimated estimation value becomes equal to the detected detection value, and determine a first input to be inputted to the plant, according to the identified model parameter.

66. A control unit as claimed in claim 65, wherein the control program causes the computer to determine a second input to be inputted to the plant such that the detection value is caused to converge to a predetermined target value, and

wherein the first internal variable comprises a plurality of first internal variables, and

wherein the simulation value comprises a plurality of simulation values simulating respective behaviors of the plurality of first internal variables,

wherein the model parameter comprises a plurality of model parameters, and

wherein when the control program causes the computer to identify the model parameter, the control program causes the computer to identify the plurality of model parameters according to the detection value and the plurality of simulation values such that the estimated estimation value becomes equal to the detected detection value, and

wherein when the control program causes the computer to determine the first input, the control

program causes the computer to determine the first input such that the identified model parameters converge to an average value thereof.

67. A control unit as claimed in claim 65, wherein when the control program causes the computer to determine the first input, the control program causes the computer to calculate a learned correction value of the first input, using a sequential statistical algorithm, correct the first input using the calculated learned correction value, and input the corrected first input to the plant.

68. A control unit as claimed in claim 67, wherein when the control program causes the computer to calculate the learned correction value, the control program causes the computer to calculate the learned correction value of the first input using a regression equation in which the learned correction value is used as a dependent variable and a second internal variable having influence on the first internal variable is used as an independent variable, and calculate a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

69. A control unit as claimed in claim 65, wherein when the control program causes the computer to determine the first input, the control program causes the computer to determine an input component contained in the first input based on a difference between the model parameter and a predetermined target value.

70. A control unit as claimed in claim 69, wherein when the control program causes the computer to determine the first input, the control program causes the computer to determine other input components than the input component contained in the first input, based

on the model parameter.

71. A control unit as claimed in claim 65, wherein when the control program causes the computer to determine the first input, the control program causes the computer to determine the first input according to the model parameter with a response-specified control algorithm.

72. A control unit as claimed in claim 65, wherein when the control program causes the computer to identify the model parameter, the control program causes the computer to identify the model parameter by a fixed gain method.

73. A control unit as claimed in claim 68, wherein when the control program causes the computer to identify the model parameter, the control program causes the computer to identify the model parameter by calculating a model parameter reference value according to the second internal variable, and add a predetermined correction component to the calculated model parameter reference value.

74. A control unit as claimed in claim 65, wherein the control program causes the computer to delay one of the detection value and the simulation value by a predetermined delay time period, and

wherein when the control program causes the computer to identify the model parameter, the control program causes the computer to identify the model parameter according to the delayed one of the detection value and the simulation value, and the other of the detection value and the simulation value.

75. A control unit as claimed in claim 65, wherein the control program causes the computer to generate a filtered value of the detection value by

subjecting the detection value to predetermined filtering processing, and

wherein when the control program causes the computer to identify the model parameter, the control program causes the computer to identify the model parameter according to the filtered value of the detection value and the simulation value.

76. A control unit for an internal combustion engine including a plurality of cylinders, a plurality of exhaust passages extending from the plurality of cylinders, respectively, and one exhaust passage into which the plurality of exhaust passages are combined, the control unit including a control program for causing a computer to perform a control process for controlling an amount of fuel to be supplied to the plurality of cylinders, on a cylinder-by-cylinder basis, thereby controlling an air-fuel ratio of exhaust gases emitted from the plurality of cylinders, wherein the control program causes the computer to determine an amount of fuel to be supplied to each of the plurality of cylinders, detect an air-fuel ratio parameter indicative of an air-fuel ratio of exhaust gases in the one exhaust passage, generate a plurality of simulation values simulating respective behaviors of air-fuel ratios of exhaust gases emitted from the plurality of cylinders, estimate an estimation value of the air-fuel ratio parameter based on a model defining a relationship between the estimation value and the plurality of simulation values, identify a plurality of model parameters of the model according to the detected air-fuel ratio parameter and the generated plurality of simulation values, such that the estimation value of the air-fuel ratio parameter becomes equal to the

detected air-fuel ratio parameter, calculate a first correction value for correcting the amount of fuel to be supplied to the plurality of cylinders, according to the identified plurality of model parameters, on a cylinder-by-cylinder basis, and correct the determined amount of fuel according to the calculated first correction value, on a cylinder-by-cylinder basis.

77. A control unit as claimed in claim 76, wherein the control program causes the computer to calculate a second correction value for correcting the amount of fuel to be supplied to each cylinder, such that the air-fuel ratio parameter is caused to converge to a predetermined target value, and correct the amount of fuel to be supplied to each cylinder according to the calculated second correction value, and

wherein when the control program causes the computer to calculate the first correction value, the control program causes the computer to calculate the first correction value, on a cylinder-by-cylinder basis, such that the identified plurality of model parameters converge to an average value thereof.

78. A control unit as claimed in claim 76, wherein the control program causes the computer to calculate a learned correction value of the first correction value with a sequential statistical algorithm, on a cylinder-by-cylinder basis, and

wherein when the control program causes the computer to correct the amount fuel, the control program causes the computer to correct the amount of fuel further according to the calculated learned correction value, on a cylinder-by-cylinder basis.

79. A control unit as claimed in claim 78, wherein the control program causes the computer to

detect an operating condition parameter indicative of an operating condition of the engine, and

wherein when the control program causes the computer to calculate the learned correction value, the control program causes the computer to calculate the learned correction value using a regression equation in which the learned correction value is used as a dependent variable and the detected operating condition parameter is used as an independent variable, and calculate a regression coefficient and a constant term of the regression equation with the sequential statistical algorithm.

80. A control unit as claimed in claim 76, wherein when the control program causes the computer to calculate the first correction value, the control program causes the computer to calculate a correction value component contained in the first correction value based on a difference between the identified model parameters and a predetermined target value.

81. A control unit as claimed in claim 80, wherein when the control program causes the computer to calculate the first correction value, the control program causes the computer to calculate other correction value components than the correction value component contained in the first correction value, based on the identified model parameters.

82. A control unit as claimed in claim 76, wherein when the control program causes the computer to calculate the first correction value, the control program causes the computer to calculate the first correction value according to the model parameters with a response-specified control algorithm.

83. A control unit as claimed in claim 76,

wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters by a fixed gain method.

84. A control unit as claimed in claim 79, wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters by calculating respective model parameter reference values according to the operating condition parameter, and adding predetermined correction components to the calculated model parameter reference values, respectively.

85. A control unit as claimed in claim 76, wherein the control program causes the computer to delay the air-fuel ratio parameter by a predetermined delay time period, and

wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters according to the delayed air-fuel ratio parameter and the plurality of simulation values.

86. A control unit for an internal combustion engine including one intake passage, a plurality of intake passages branching from the one intake passage, and a plurality of cylinders connected to the plurality of intake passages extend, respectively, the control unit including a control program for causing a computer to perform a control process for controlling an amount of fuel to be supplied to the plurality of cylinders, on a cylinder-by-cylinder basis, thereby controlling an air-fuel ratio of exhaust gases emitted from the plurality of cylinders, wherein the control program

causes the computer to determine an amount of fuel to be supplied to each of the plurality of cylinders, detect an intake air amount parameter indicative of an amount of intake air in the one intake passage, generate a plurality of simulation values simulating respective behaviors of amounts of intake air to be drawn into the plurality of cylinders, estimate an estimation value of the intake air amount parameter based on a model defining a relationship between the estimation value and the plurality of simulation values, identifying a plurality of model parameters of the model according to the detected intake air amount parameter and the generated plurality of simulation values, such that the estimation value of the intake air amount parameter becomes equal to the detected intake air amount parameter, calculate a third correction value for correcting the amount of fuel to be supplied to the plurality of cylinders, according to the identified plurality of model parameters, on a cylinder-by-cylinder basis, and correct the determined amount of fuel according to the calculated third correction value, on a cylinder-by-cylinder basis.

87. A control unit as claimed in claim 86, wherein the engine includes a plurality of exhaust passages extending from the plurality of cylinders, respectively, and one exhaust passage into which the plurality of exhaust passages are combined,

wherein the control program causes the computer to detect an air-fuel ratio parameter indicative of an air-fuel ratio of exhaust gases in the one exhaust passage, calculate a fourth correction value for correcting the amount of fuel to be supplied to each cylinder, such that the detected air-fuel ratio

parameter is caused to converge to a predetermined target value, and correct the amount of fuel to be supplied to each cylinder according to the calculated fourth correction value, and

wherein when the control program causes the computer to calculate the third correction value, the control program causes the computer to calculate the third correction value, on a cylinder-by-cylinder basis, such that the identified plurality of model parameters converge to an average value thereof.

88. A control unit as claimed in claim 86, wherein the control program causes the computer to calculate a learned correction value of the third correction value with a sequential statistical algorithm, on a cylinder-by-cylinder basis, and

wherein when the control program causes the computer to correct the amount of fuel, the control program causes the computer to correct the amount of fuel further according to the calculated learned correction value, on a cylinder-by-cylinder basis.

89. A control unit as claimed in claim 88, wherein the control program causes the computer to detect an operating condition parameter indicative of an operating condition of the engine, and

wherein when the control program causes the computer to calculate the learned correction value, the control program causes the computer to calculate the learned correction value using a regression equation in which the learned correction value is used as a dependent variable and the detected operating condition parameter is used as an independent variable, and calculate a regression coefficient and a constant term of the regression equation with the sequential

statistical algorithm.

90. A control unit as claimed in claim 86, wherein when the control program causes the computer to calculate the third correction value, the control program causes the computer to calculate a correction value component contained in the third correction value based on a difference between the identified model parameters and a predetermined target value.

91. A control unit as claimed in claim 90, wherein when the control program causes the computer to calculate the third correction value, the control program causes the computer to calculate other correction value components than the correction value component contained in the third correction value, based on the identified model parameters.

92. A control unit as claimed in claim 86, wherein when the control program causes the computer to calculate the third correction value, the control program causes the computer to calculate the third correction value according to the model parameters with a response-specified control algorithm.

93. A control unit as claimed in claim 86, wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters by a fixed gain method.

94. A control unit as claimed in claim 89, wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters by calculating respective model parameter reference values according to the operating condition parameter, and adding predetermined correction

components to the calculated model parameter reference values, respectively.

95. A control unit as claimed in claim 86, wherein the control program causes the computer to delay the plurality of simulation values by a predetermined delay time period, and

wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters according to the intake air amount parameter and the delayed plurality of simulation values.

96. A control unit as claimed in claim 86, wherein the control program causes the computer to generate a filtered value of the intake air amount parameter by subjecting the intake air amount parameter to predetermined filtering processing, and

wherein when the control program causes the computer to identify the model parameters of the model, the control program causes the computer to identify the model parameters according to the generated filtered value of the intake air amount parameter and the plurality of simulation values.